

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Changes in accordance with NOR 5962-R148-92.	92-02-20	Alan Barone
B	Table I; changed the max limit for the overload power dissipation test from 6 watts to 7 watts. Redrew entire document. -sld	01-03-26	Raymond Monnin
C	Update drawing. -gz	08-01-29	Robert M. Heber
D	Table II, add note to Group C end-point test parameters. Update boilerplate paragraphs. -gz	10-02-02	Charles F. Saffle

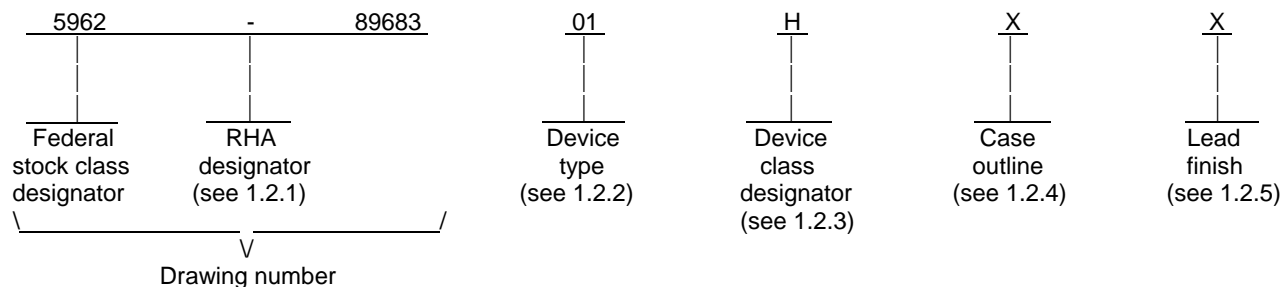
THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

REV																							
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REV STATUS	REV			D	D	D	D	D	D	D	D	D	D	D	D	D							
OF SHEETS	SHEET			1	2	3	4	5	6	7	8	9	10	11	12								
PMIC N/A				PREPARED BY Steve Duncan				DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216-3990 http://www.dscc.dla.mil/															
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A				CHECKED BY Robert M. Heber																			
				APPROVED BY William K. Heckman				MICROCIRCUIT, HYBRID, LINEAR, 5-VOLT, SINGLE CHANNEL, DC/DC CONVERTER															
				DRAWING APPROVAL DATE 91-03-15																			
				REVISION LEVEL D				SIZE A	CAGE CODE 67268	5962-89683													
								SHEET	1 OF 12														

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	AHE2805S	DC/DC converter, 15 W, 5 V output
02	AHE2805S/CH-SLV	DC/DC converter, 15 W, 5 V output
03	AHE2805S/CH-MSTR	DC/DC converter, 15 W, 5 V output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

<u>Device class</u>	<u>Device performance documentation</u>
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

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1.2.4 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
X	See figure 1	10	Dual-in-line
Z	See figure 1	10	Flange package

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Input voltage	-0.5 V dc to +50 V dc
Power dissipation (P_D)	7 W
Lead temperature (soldering, 10 seconds)	+300°C
Storage temperature	-65°C to +135°C

1.4 Recommended operating conditions.

Input voltage range	+17V dc to +40 V dc
Case operating temperature range (T_C).....	-55°C to +125°C
Output power 2/.....	≤ 15 W

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard for Electronic Component Case Outlines.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

- 1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
2/ Derate output power linearly above case temperature +125°C to 0 at +135°C.

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3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 shall include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outlines. The case outlines shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking of devices. Marking of devices shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C V _{IN} = 28 V dc ±5%, C _L = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Output voltage	V _{OUT}	I _{OUT} = 0	1	All	4.95	5.05	V
			2,3		4.90	5.10	
Output adjust <u>1/</u>	V _{OA}	Pin 3 shorted to pin 4	1,2,3	All	4	6	%V _{OUT}
Output current <u>2/</u>	I _{OUT}	V _{IN} = 17, 28, and 40 V dc	1,2,3	All		3000	mA
Output ripple voltage <u>3/</u>	V _{RIP}	V _{IN} = 17, 28, and 40 V dc, B.W. = dc to 2 MHz	1,2,3	All		60	mV p-p
Output power <u>2/ 4/</u>	P _{OUT}	V _{IN} = 17, 28, and 40 V dc	1,2,3	All	15		W
Line regulation	V _{RLINE}	V _{IN} = 17, 28, and 40 V dc, I _{OUT} = 0, 1.5, and 3.0 A	1	All		5	mV
			2,3			25	
Load regulation	V _{RLOAD}	V _{IN} = 17, 28, and 40 V dc, I _{OUT} = 0, 1.5, and 3.0 A	1,2,3	All		50	mV
Input current	I _{IN}	I _{OUT} = 0, inhibit (pin 2) tied to input return (pin 10)	1,2,3	All		18	mA
		I _{OUT} = 0, inhibit (pin 2) = open				35	
Input ripple current <u>3/</u>	I _{RIP}	I _{OUT} = 3.0 A, B.W. = dc to 2 MHz	1,2,3	All		50	mA p-p
Efficiency	E _{FF}	I _{OUT} = 3.0 A, T _C = +25°C	1	All	80		%
Isolation	ISO	Input to output or any pin to case (except pin 8) at 500 V dc, T _C = +25°C	1	All	100		MΩ
Capacitive load <u>5/ 6/</u>	C _L	No effect on dc performance, T _C = +25°C	4	All		500	μF
Power dissipation, load fault	P _D	Overload, T _C = +25°C <u>7/</u>	1	All		7	W
		Short circuit, T _C = +25°C				6	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions -55°C ≤ T _C ≤ +125°C V _{IN} = 28 V dc ±5%, C _L = 0 unless otherwise specified	Group A subgroups	Device types	Limits		Unit
					Min	Max	
Switching frequency	F _S	I _{OUT} = 3.0 A	4,5,6	01	225	275	kHz
				02	225	245	
				03	250	275	
Output response to step transient load changes <u>8/</u>	V _O T _{LOAD}	50% load to/from 100% load	4	All	-300	+300	mV pk
			5,6		-450	+450	
		No load to/from 50%	4	All	-500	+500	
			5,6		-750	+750	
Recovery time step transient load changes <u>8/ 9/</u>	T _T LOAD	50% load to/from 100% load	4,5,6	All		70	μs
		No load to/from 50% load				200	
		50% load to no load				5	ms
Output response to transient step line changes <u>6/ 10/</u>	V _O T _{LINE}	Input step 17 to 40 V dc	4	All		300	mV pk
			5,6			450	
		Input step 40 to 17 V dc	4,5,6	All		-1000	
Recovery time transient step line changes <u>6/ 9/ 10/</u>	T _T LINE	Input step 17 to 40 V dc	4,5,6	All		800	μs
		Input step 40 to 17 V dc				800	
Turn on overshoot	V _{ton} OS	I _{OUT} = 0 A	4	All		500	mV pk
			5,6			550	
		I _{OUT} = 3.0 A	4,5,6			550	
Turn-on delay	T _{onD}	I _{OUT} = 0 A and 3.0 A <u>11/</u>	4,5,6	All		10	ms
Load fault recovery <u>6/</u>	tr _{LF}		4,5,6	All		10	ms

See footnotes at top of next page.

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TABLE I. Electrical performance characteristics - Continued.

- 1/ The output voltage of this device can be adjusted upward by connecting pin 3 and pin 4 as follows:

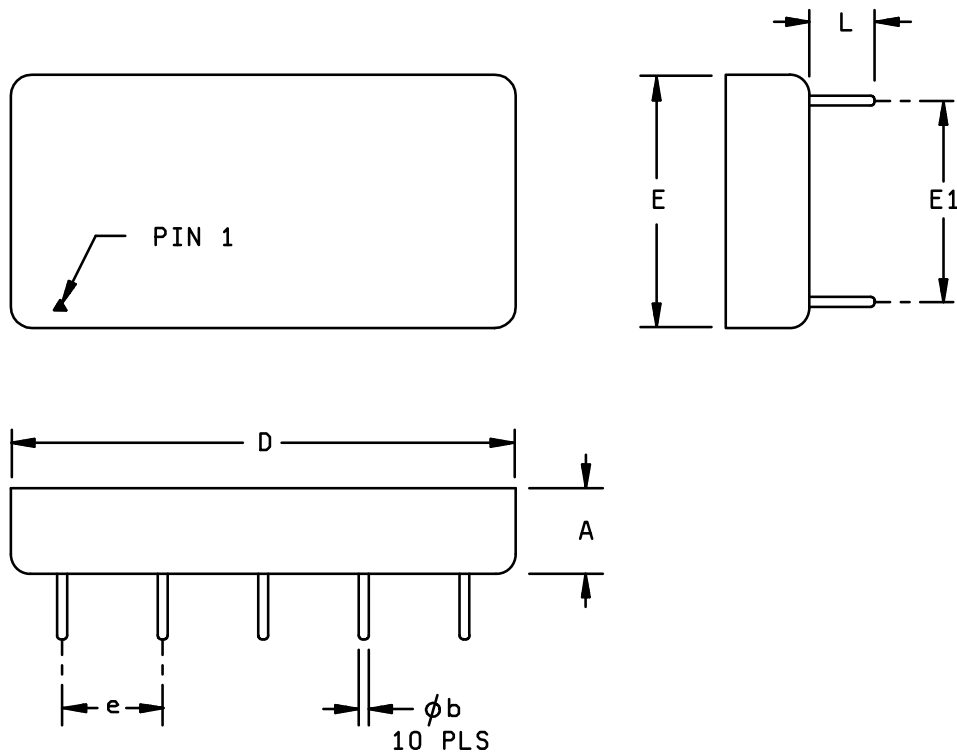
Output adjustment resistor values

Resistance pin 3 to pin 4	Output voltage increase, %
∞	0
390 k Ω	+1%
145 k Ω	+2%
63 k Ω	+3%
22 k Ω	+4%
0	+5%

- 2/ Parameter guaranteed by line and load regulation tests.
- 3/ Bandwidth guaranteed by design. Tested for 20 kHz to 2 MHz.
- 4/ For operation at 16 V dc input, derate output by 33 percent.
- 5/ Capacitive load may be any value from 0 to the maximum limit without affecting dc performance. A capacitive load in excess of the maximum limit will not disturb loop stability but may interfere with the operation of the load fault detection circuitry, appearing as a short circuit during turn on.
- 6/ Parameter shall be tested as part of design characterization and after design and or process changes. Therefore the parameter shall be guaranteed to the limits specified in table I.
- 7/ An overload is that condition with a load in excess of the rated load but less than that necessary to trigger the short circuit protection and is the condition of maximum power dissipation.
- 8/ Load step transition time between 2 and 10 microseconds.
- 9/ Recovery time is measured from the initiation of the transient to where V_{OUT} has returned to within ± 1 percent of V_{OUT} at 50 percent load.
- 10/ Input step transition time between 2 and 10 microseconds.
- 11/ Turn on delay time measurement is for either a step application of power at input or the removal of a ground signal from the inhibit pin (pin 2) while power is applied to the input.

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Case outline X.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		12.57		.495
ϕb	0.89	1.14	.035	.045
D		53.85		2.120
e	10.03	10.28	.395	.405
E		28.45		1.120
E1	20.19	20.45	.795	.805
L	6.48	6.73	.255	.265

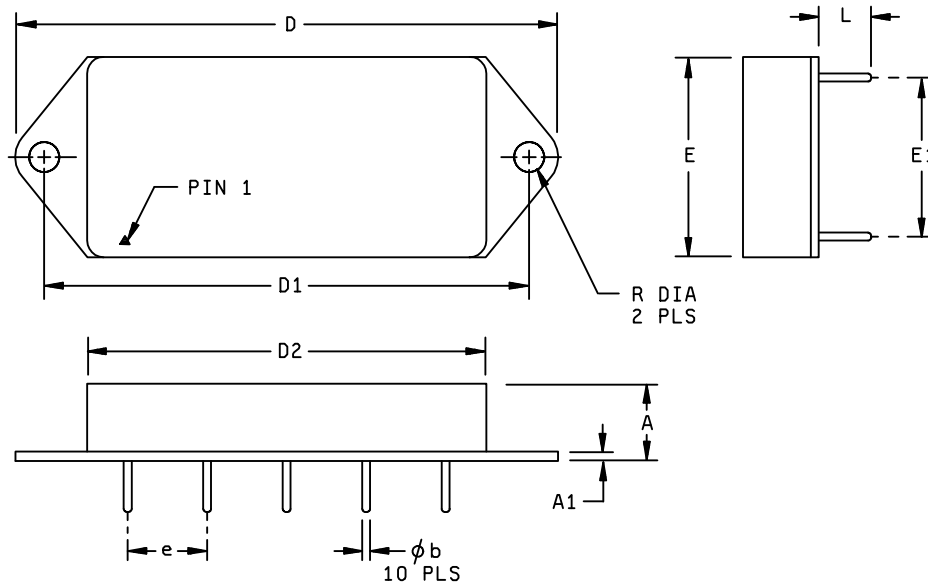
NOTES:

1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Case outline X weight: 55 grams maximum.

FIGURE 1. Case outlines.

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Case outline Z.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		12.57		.495
A1	1.14	1.52	.045	.060
ϕb	0.89	1.14	.035	.045
D		73.15		2.880
D1	64.52	65.02	2.540	2.560
D2		53.85		2.120
e	10.03	10.28	.395	.405
E		28.45		1.120
E1	20.19	20.45	.795	.805
L	6.48	6.73	.255	.265
R	3.99	4.24	.157	.167

NOTES:

1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Case outline Z weight: 58 grams maximum.

FIGURE 1. Case outlines - Continued.

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Device types	01	02 and 03
Case outlines	X and Z	X and Z
Terminal number	Terminal symbol	Terminal symbol
1	Input	Input
2	Inhibit in	Inhibit in
3	Output adjust	Output adjust
4	Output return	Output return
5	Output	Output
6	No connection	No connection
7	No connection	No connection
8	Case ground	Case ground
9	No connection	Sync in/out
10	Input return	Input return

FIGURE 2. Terminal connections.

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TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters <u>1/</u>	1, 2, 3, 4
End-point electrical parameters for Radiation Hardness Assurance (RHA) devices	Not applicable

* PDA applies to subgroup 1.

1/ As a minimum, for all Group C testing performed after February 2, 2010 manufacturers shall perform subgroups 1, 2, and 3 from the Group A electrical test table (Table C-Xa of MIL-PRF-38534).

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

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4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein.
- b. Steady-state life test, method 1005 of MIL-STD-883.
 - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.
 - (2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.
 - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5 Radiation Hardness Assurance (RHA) inspection. RHA inspection is not currently applicable to this drawing.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus (DSCC) when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-3990, or telephone (614) 692-1081.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 10-02-02

Approved sources of supply for SMD 5962-89683 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534. DSCC maintains an online database of all current sources of supply at <http://www.dsccl.dla.mil/Programs/Smcr/>.

Standard microcircuit drawing PIN <u>1</u> /	Vendor CAGE number	Vendor similar PIN <u>2</u> /
5962-8968301HXA 5962-8968301HXC 5962-8968301HZA 5962-8968301HZC	52467 <u>3</u> / 52467 <u>3</u> /	AHE2805S/CH AHE2805S/CH AHE2805SF/CH AHE2805SF/CH
5962-8968302HXA 5962-8968302HXC 5962-8968302HZA 5962-8968302HZC	52467 <u>3</u> / 52467 <u>3</u> /	AHE2805S/CH-SLV AHE-2805S/CH-SLV AHE2805SF/CH-SLV AHE2805SF/CH-SLV
5962-8968303HXA 5962-8968303HXC 5962-8968303HZA 5962-8968303HZC	52467 <u>3</u> / 52467 <u>3</u> /	AHE2805S/CH-MSTR AHE2805S/CH-MSTR AHE2805SF/CH-MSTR AHE2805SF/CH-MSTR

- 1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.
- 2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.
- 3/ Not available from an approved source.

Vendor CAGE
number

52467

Vendor name
and address

International Rectifier - HiRel Products, Incorporated
2270 Martin Ave
Santa Clara, CA 95050

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